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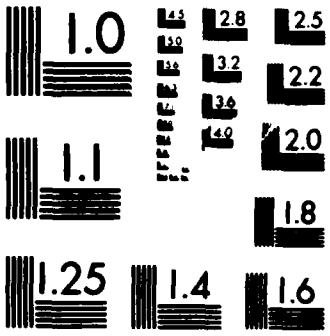

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Research and Development Report

A PORTABLE INTERACTIVE PLOTTER FOR DIGITAL X-Y DATA

by

Gordon C. Everstine

DTNSRDC CMLD-86/45 A Portable Interactive Plotter for Digital X-Y Data

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This report describes the use of a computer program called IPLOT for interactively generating X-Y plots of digital data. The program is built around the widely-available DISSPLA plotting software in order to be as portable as possible. IPLOT has command and input file structures similar to those of the IDDS program used at DTNSRDC, except that IPLOT can label axes and generate logarithmic plots. A checkpoint/restart capability is included.

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ABSTRACT

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INTRODUCTION

For many engineering analyses performed on a computer, there is a need to make X-Y plots quickly in an interactive mode where the analyst can easily select the curves to be plotted together, the scaling, the window size, the line styles, and the labeling. Some of this need has been satisfied for many years at DTNSRDC with the IDDS program[1] written by Melvin Haas and others of the Numerical Mechanics Division of DTNSRDC. However, the mainframe version of IDDS is machine-dependent and may not be converted for use on the new Cray/Sperry computer system to be installed in a few months at DTNSRDC. (Development is continuing on the Apollo version of IDDS called AIDDS. Since AIDDS is written in the C language for a UNIX system, it may eventually be available on the new Sperry/Cray system.) In addition, IDDS is unable to label axes or to make logarithmic plots, both of which capabilities are useful for the display of results generated by the acoustic radiation program

NASHUA. As a result, a new interactive plotting program (IPLOT) was written as a general replacement for the X-Y plotting capabilities in IDDS. (The other capabilities in IDDS are not being addressed.)

IPLOT was built around and designed to run on any computer which has access to the Display Integrated Software System and Plotting Language (DISSPLA),[2] versions of which are available at many computer centers. To date, IPLOT has been run on both the CDC Cyber 176 and DEC VAX 11/780 computers at DTNSRDC. IPLOT is written in Fortran 77 and, as is, interfaces with a Fortran 4 version of DISSPLA[3] (which DTNSRDC has). The conversion of IPLOT to interface with a Fortran 77 version of DISSPLA would require changing a few of the calls to DISSPLA routines, since Hollerith, rather than character, variables must be passed to a Fortran 4 version of DISSPLA. However, all necessary character variables exist in IPLOT to ease the conversion to a Fortran 77 version of DISSPLA.

IPLOT can interface with all the Tektronix and DEC terminals in common use at DTNSRDC. Other terminals could easily be added to the program, since DISSPLA supports a wide variety of terminals. IPLOT has the capabilities to make plots with logarithmic as well as linear axes and to label the axes.

IPLOT uses an input file structure and a command structure similar to those used in IDDS. Thus, many formatted data files in use with IDDS can be converted for use with IPLOT with a single command of an editor.

IPLOT also has a checkpoint/restart capability so that the plotting parameters (device, scaling, labeling, etc.) specified in one session can be retrieved for use in a subsequent session. The local file name IPLOTXX is used for both the checkpoint file and the restart file.

IPLOT PROGRAM USAGE

INPUT DATA FILE

The file containing the X-Y pairs must be a formatted file with each curve defined in the following way:

Record 1:	A 10-character left-adjusted "short name" for the curve. This name is used for identifying the curve during the interactive plotting session.
Record 2:	An 80-character left-adjusted "long name" for the curve
Record 3:	N (the number of X-Y pairs in the curve) (integer)
Records 4,5, ... :	X_1, Y_1, X_2, Y_2, X_3, Y_3, ... ,X_N, Y_N (real)

The above set of records is repeated for each curve placed on the file. Each record is an 80-character "card image." All numeric data are read using free-field formats, so that the X-Y pairs may be written using any real format on any number of card images. There are no restrictions on the number of curves contained on a file. If a logarithmic plot is desired, the actual values of the data rather than the logarithms of the data are supplied on this input file.

THE INTERACTIVE SESSION

At DTNSRDC, the executable form of IPLOT is stored on the mass store file IPLOT under the user name CAEE. Before executing this program interactively, the user must attach the data file(s) containing the X-Y pairs. Multiple files are allowed. In general, any combination of curves from any number of files can be plotted on the same graph. The axes may be either linear or logarithmic, and axes may be numbered and labeled. The

window size (the size of the box containing the graph) may be adjusted to facilitate overlaying other plots.

To continue a previous plotting session, the restart file must be attached and given the local file name IPLOTXX. At the beginning of execution, IPLOT checks for the existence of IPLOTXX. If the file exists, IPLOT retrieves the plotting parameters so that the user is ready to continue his previous session where he left off. As the new session proceeds, IPLOTXX is replaced whenever a plot is made or the session is ended.

IPLOT COMMANDS

IPLOT uses a free-field input format with the various data fields separated by commas, which are required. Blanks may be placed before or after the commas to improve readability. In general, a parameter which is omitted remains unchanged from that set previously. The allowable commands are summarized as follows:

C,FILENAME	- List contents of file FILENAME. For each curve on the file, this listing includes the short name, the number of X-Y pairs, the maximum and minimum ordinate values, and the long name.
E	- Exit from program.
H	- Help (i.e., print summary of commands).
I	- Toggle to use or not use integer labels on linear axes.
L,NX,NY	- Use logarithmic axis, where NX and NY are the number of cycles along x and y, respectively (integer). (A zero value is used to specify a linear axis.) Entering L with no parameters is equivalent to L,0,0.

M	- Toggle to mark or not mark the ends of the curves with numerical symbols.
P,FN_1,SN_1,LS_1,FN_2,SN_2,LS_2,...	- Plot some curves, where FN = filename, SN = short name of curve, LS = line style desired (1-9). To plot the points with symbols not connected by a line, enter LS = 0. IPLOT selects the symbols. If several curves have been plotted, the first few can subsequently be plotted by entering P followed by a number of commas equal to three times the number of curves desired (e.g., P,,,,,,).
Q	- Quit (same as Exit).
R	- Repeat last plot command.
S,XMIN,DX,XMAX,YMIN,DY,YMAX	- Scale a plot using the specified minimum, incremental step, and maximum values of X and Y. This command is required, since there is no default scaling. For a logarithmic axis, for which the number of cycles is specified, only the minimum value is used. For integer values, the decimal points may be omitted on CDC (but not on VAX).
T,<string>	- Specify the title of the plot.
V	- Verify (i.e., display) the current values of the user-selected parameters.
W,RX,RY	- Change the current window size by the factors RX and RY in the X and Y directions, respectively. To restore the default window size, enter W with no parameters.
X,<string>	- Specify the x-axis label.
Y,<string>	- Specify the y-axis label.

All the above commands except the plot command (P) have as their only effect the setting of one or more parameters or the display of some information. When the plot command is issued, the current values of all parameters and labels (which can be displayed with the V command) are used

for the plot. In general, the commands may be entered in any order, except that S (scale) must precede P (plot), since there is no default scaling in IPLOT.

After each plot is made, the program pauses to allow the user to make a copy of the plot. To return to the "command mode," the CDC user enters a space followed by the carriage return; the VAX user need only press the carriage return.

Sample plots (both linear and logarithmic) are shown in Figs. 1 and 2 for illustration. The second figure also uses the curve marking option. All plots were made from the same data.

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Kevin G. Brady of the User Services Branch (DTNSRDC Code 1892.1) is gratefully acknowledged with pleasure for sharing his considerable expertise on DISSPLA and Fortran.

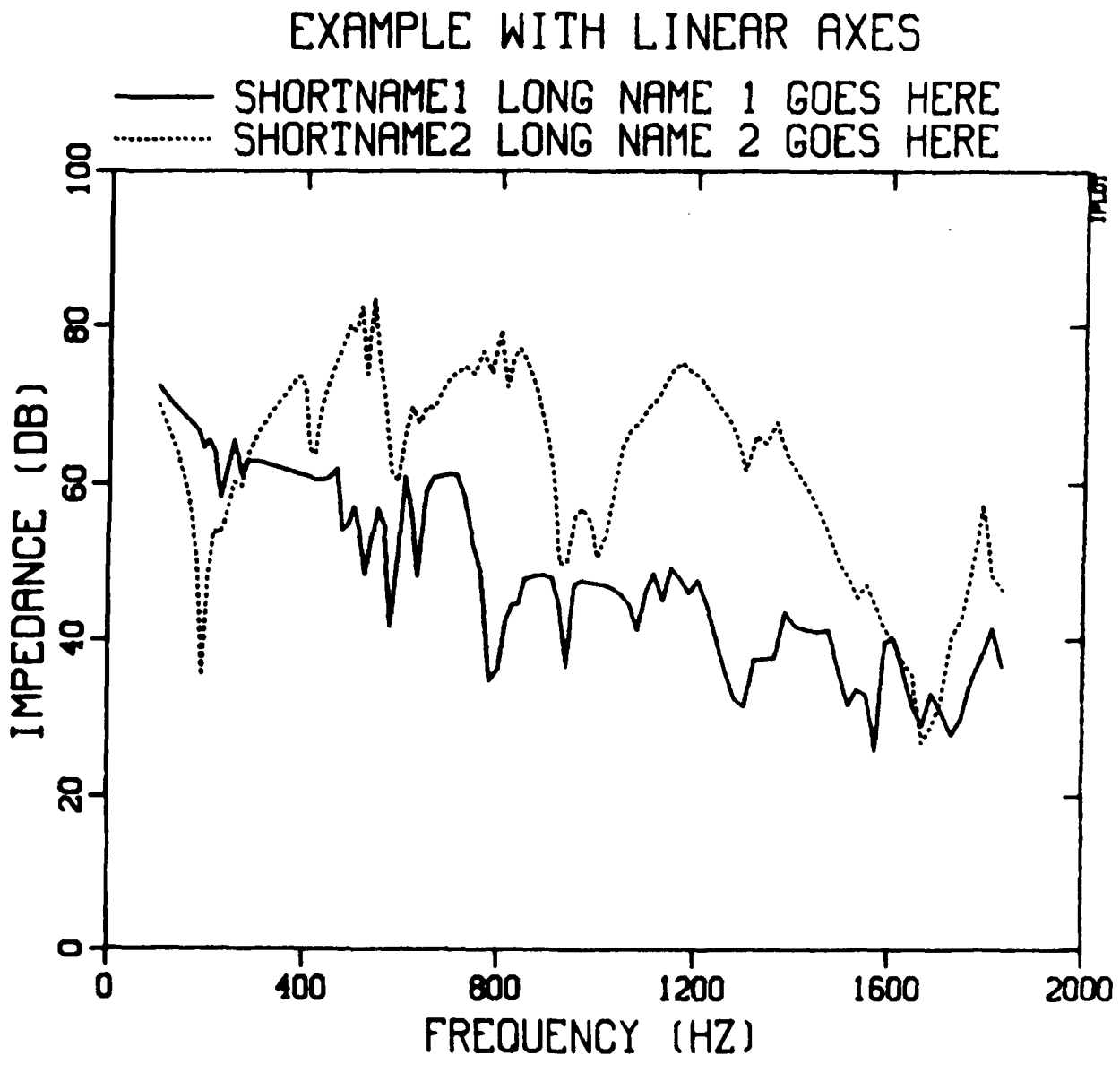

Fig. 1. Sample plot with linear axes.

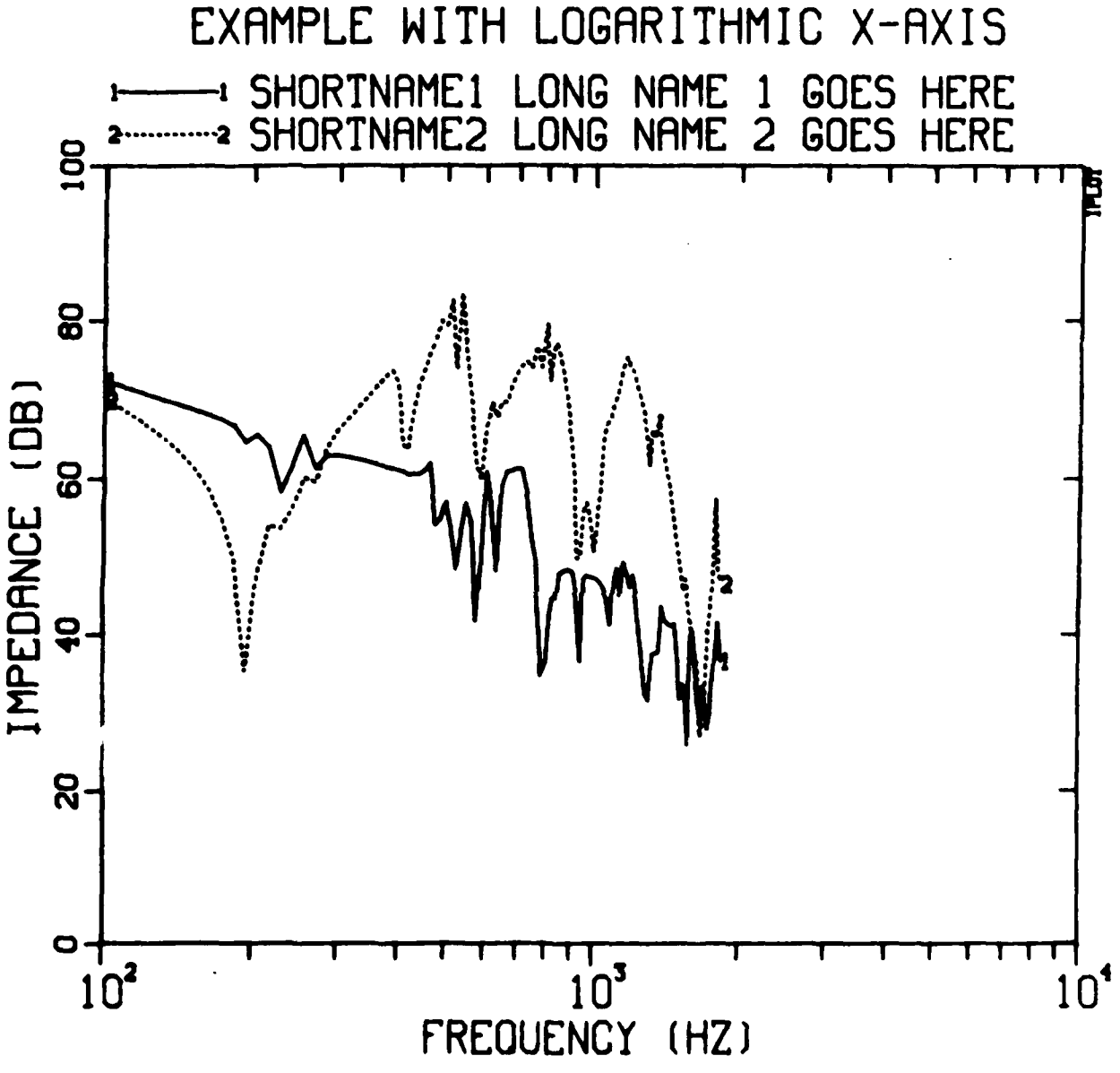

Fig. 2. Sample plot with logarithmic x-axis and curves marked.

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